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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

**Office Action Summary****Application No.**

10/576,134

**Applicant(s)**

BARRERA ET AL.

**Examiner**

Peter Y. Choi

**Art Unit**

1786

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 October 2011.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 5) ☒ Claim(s) 41,43,45-53,55-69,71,72,74 and 75 is/are pending in the application.
- 5a) Of the above claim(s) 50-53,55-67,71 and 72 is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 41,43,45-49,68,69,74 and 75 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 17 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-940)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicants' submission filed on October 5, 2011, has been entered.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 74 and 75 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding claim 74, the claim recites that the organosilane species comprises oxygen covalently bound to the carbon nanotubes, and wherein the adding comprises introducing the silane-functionalized carbon nanotubes onto the fibers. Applicants' specification as originally filed, specifically at paragraph 0076, does not appear to recite or provide support for the claimed limitation.

Regarding claim 75, the claim recites that the organosilane species comprises nitrogen covalently bound to the carbon nanotubes, and wherein the adding comprises: resizing the fibers with an amino-silane moiety so as to form silane-functionalized fibers; providing fluorinated carbon nanotubes; and reacting the fluorinated carbon nanotubes with the amino-silane moiety. Applicants' specification as originally filed, specifically at paragraph 0076, does not appear to recite or provide support for the claimed limitation.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 41, 43, 45-49, 68, 69, 74, and 75 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 41, 43, 45-49, 68, 69, 74, and 75, claim 41 recites that the fiber reinforcement material is silane-functionalized with the organosilane species. Previously, the claim recites that the carbon nanotubes are silane-functionalized with an organosilane species, and that the carbon nanotubes are covalently bound to the fiber reinforcement material via the organosilane species. It is unclear whether the organosilane species in the fiber reinforcement is merely the same type of organosilane species as the silane-functionalized carbon nanotubes, or whether the organosilane species in the fiber reinforcement is literally the same organosilane species as in the silane-functionalized carbon nanotubes. In other words, it is unclear whether the fiber reinforcement material and carbon nanotubes are functionalized with literally the same organosilane species, or whether the fiber reinforcement material and carbon nanotubes are

functionalized with the same type of organosilane species. For purposes of examination, the claim will be interpreted as the fiber reinforcement material and carbon nanotubes being functionalized with merely the same type of organosilane species.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 41 and 45-47 are rejected under 35 U.S.C. 103(a) as obvious over US Pub. No. 2005/0191490 to Ton-That in view of USPN 6,270,897 to Flautt.

Regarding claims 41 and 45-47, Ton-That teaches a composite material, comprising carbon nanotubes, a fiber reinforcement material, and a polymer (Ton-That, Abstract; *see additionally* paragraphs 0002-0022, 0025-0030, 0034-0042, 0050-0056, 0064, 0075, 0077, 0078). Ton-That teaches that the carbon nanotubes are treated with organophilic modifying compounds to enhance physical and chemical interaction between the nano-reinforcing material and an epoxy group of an epoxy-functionalized graft polymer (Id., paragraph 0029). Ton-That teaches that the organophilic modifying compounds may include silanes (Id.) and that the polymer is an epoxy (Id., Abstract, 0052-0076).

Ton-That teaches that the composite material may comprise various additives such as glass fibers (paragraphs 0077, 0078). Additionally, the choice of incorporating glass fibers would have been obvious to one of ordinary skill in the reinforcing composite material art at the

time the invention was made, as Ton-That teaches the suitability of glass fibers in the reinforcing composite, and including glass fibers would have been obvious based on the desired tensile and flexural strength of the composite suitable for the intended application.

Ton-That does not appear to teach that the glass fibers are silane-functionalized with the organosilane species. However, Flautt teaches a substantially similar glass fiber reinforced composite material comprising glass fibers and an epoxy matrix (Flautt, column 1 line 7 to column 5 line 10, claims 1-14). Flautt teaches that sizing the glass fibers with an organosilane reduces interfilament abrasion, and improves compatibility of the fibers with the epoxy matrix material of the composite structure.

Therefore, it would have been obvious to one of ordinary skill in the composite art at the time the invention was made to form the composite material of Ton-That, wherein the glass fibers are sized with an organosilane, as taught by Flautt, motivated by the desire of forming a conventional composite material wherein the interfilament abrasion of the glass fibers is reduced, the compatibility of the fibers with the epoxy matrix material is improved, and the physical properties of the composite material is enhanced.

Regarding the claimed covalent bonding, each of Ton-That and Flautt independently teach the incorporation of an organosilane with each of the nanofibers and the glass fibers, and the attendant advantages. Additionally, based on the combined teachings of Ton-That and Flautt, it is reasonable for one of ordinary skill in the art to expect that functionalizing the carbon nanotubes increases the number of bonding sites between the carbon nanotubes and the epoxy resin, and that functionalizing the glass fibers with a silane improves bonding with the epoxy resin and the carbon nanotubes, since the nanotubes are additionally functionalized with a silane.

As set forth above, the prior art combination teaches a substantially similar structure and composition as the claimed invention. Additionally, based on Applicants' specification and Applicants' submissions of June 28, 2010, the organosilane-functionalized glass fibers will naturally covalently bond with the organosilane-functionalized carbon nanotubes. Therefore, it is reasonable for one of ordinary skill in the art to expect that once the prior art combination is formed, the carbon nanotubes will covalently bond to both the fiber reinforcement material and the epoxy resin, as both the glass fibers and the carbon nanotubes are organosilane-functionalized, and functionalizing the carbon nanotubes increases the number of bonding sites to the epoxy resin.

Regarding the claimed method of forming the composite material, it should be noted that the limitations are interpreted as product by process limitations. Absent a showing to the contrary, it is Examiner's position that the article of the applied prior art is identical to or only slightly different than the claimed article. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985). The burden has been shifted to Applicants to show unobvious differences between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983). The applied prior art either anticipated or strongly suggested the claimed subject matter. It is noted that if Applicants intend to rely on Examples in the specification or in a submitted declaration to show unobviousness, Applicants should clearly state how the

Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with the applied prior art.

8. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ton-That in view of Flautt, as applied to claims 41 and 45-47 above, and further in view of "Single-Walled Carbon Nanotube-Polymer Composites: Strength and Weakness" to Ajayan.

Regarding claim 43, Ton-That does not appear to teach that the carbon nanotubes are single-walled nanotubes. Since Ton-That is silent as to the type of nanotubes, it would have been necessary and therefore obvious to look to the prior art for conventional nanotubes suitable for use in composites. Ajayan provides this conventional teaching, showing that it was known in the composite art to form composites comprises carbon nanotube and epoxy composites, wherein the carbon nanotubes comprise single-walled nanotubes (Ajayan, pages 750-753). Ajayan teaches that various properties are known and attributed to carbon nanotubes, specifically single-walled carbon nanotubes. Additionally, Ajayan teaches that including single-walled carbon nanotubes in nanotube-epoxy composites increases the toughness of the composites by absorbing energy, strength and flexibility. It would have been obvious to one of ordinary skill in the composite art at the time the invention was made to form the composite of Ton-That, wherein the carbon nanotubes comprise single-walled carbon nanotubes, as taught by Ajayan, motivated by the desire of forming a conventional nanotube-epoxy composite comprising nanotubes known in the art as predictably suitable for use in such composites to increase the toughness of the composites by absorbing energy, strength and flexibility.

9. Claims 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ton-That in view of Flautt, as applied to claims 41 and 45-47 above, and further in view of USPN 3,312,569 to Philipps.

Regarding claims 48 and 49, the prior art combination does not appear to teach that the glass fibers are in a form of woven sheets, and that the woven sheets are stacked together with the silane-functionalized carbon nanotubes and the polymer between them. Since the prior art combination does not appear to teach in what form the glass fibers are employed, it would have been necessary and therefore obvious to look to the prior art for conventional forms of glass fibers in composites. Philipps teaches that it was known in the reinforced composite art to form a glass fiber reinforced composite comprising glass fibers and an epoxy resin, wherein the glass fibers are in the form of woven mats (Philipps, column 1 line 14 to column 4 line 35, column 7 line 15 to column 8 line 68). It would have been obvious to one of ordinary skill in the reinforced composite art at the time the invention was made to form the reinforced composite of the prior art combination, wherein the glass fibers are in the form of woven sheets, as taught by Philipps, motivated by the desire of forming a conventional reinforced composite comprising glass fibers in forms known in the art as being predictably suitable for use in reinforced composites, based on the strength and flexural characteristics suitable for the intended application, as woven sheets will predictably comprise increased dimensional stability.

Regarding claim 49, although the prior art combination does not appear to specifically teach that the carbon nanotubes and the polymer are between the stacked sheets, it naturally flows from the prior art combination that the woven glass fibers are employed in an epoxy resin composite, and uniformly dispersing the constituents of the composite, such as the nanotubes,

glass fibers, and epoxy resin, in the composite enhances the uniformity of the physical and chemical characteristics of the composite. Therefore, it would have been obvious to one of ordinary skill in the reinforced composite art at the time the invention was made to form the reinforced composite of the prior art combination, wherein the carbon nanotubes and polymer are between the woven sheets, motivated by the desire of forming a conventional reinforced composite comprising uniform physical and chemical characteristics, such that the composite comprises the desired strength, flexural characteristics, and dimensional stability suitable for the intended application.

10. Claims 68, 69 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ton-That in view of Flautt, as applied to claims 41 and 45-47 above, and further in view of Applicants' specification and "Chemical Functionalization of Carbon Nanotubes Through an Organosilane" to Velasco-Santos and US Pub. No. 2004/0211942 to Clark.

Regarding claims 68 and 69, Ton-That does not appear to teach the specific formula of the silane-functionalized carbon nanotubes and the structure of the carbon nanotubes in rolled up graphene sheets.

**Regarding the specific formula of the silane-functionalized carbon nanotubes**, since Ton-That is silent as to the specific formula of the silane-functionalized carbon nanotubes, it would have been necessary and therefore obvious to look to the prior art for conventional silane coupling agents.

Applicants' specification teaches that prior art hydroxyl-functionalized carbon nanotubes include structures set forth in Figures 1 and 2 of Applicants' specification and set forth below:

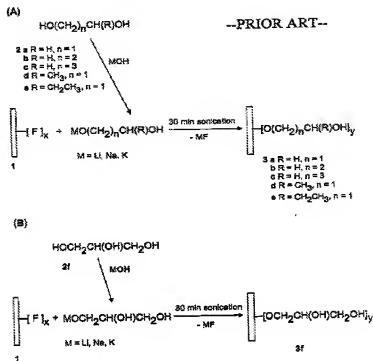


Fig. 1

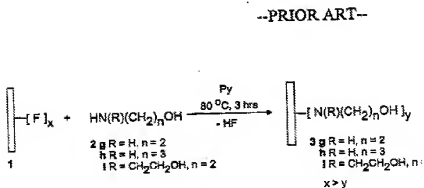


Fig. 2

Additionally, Velasco-Santos teaches reinforced composites comprising a matrix and carbon nanotubes, wherein the nanotubes are functionalized with an organo-functionalized with a silane coupling agent chemically described as  $R-Si-R'$ , wherein the  $R$  group is chosen to be reactive depending on the organic matrix used, which readily reacts with hydroxyl groups produced through oxidation on the nanotube surface (Velasco-Santos, pages 495-498). Velasco-Santos teaches that the hydroxyl-functionalized carbon nanotubes are further silane functionalized with a silation reagent such as silanol (Id.). Velasco-Santos teaches that attaching the organo-functional groups to the nanotubes improves their chemical compatibility with specific polymers. Additionally, as Velasco-Santos teaches that the  $R$  group is chosen to be reactive depending on the organic matrix used (*see* Velasco-Santos, page 495), it would have been obvious to one of ordinary skill in the reinforced composite art at the time the invention was made to form the reinforced composite of the prior art, wherein the nanotubes comprise hydroxyl groups and are silane-functionalized as set forth in Velasco-Santos and wherein the carbon nanotubes are hydroxyl-functionalized as set forth in Applicants' specification, as Applicants' specification teaches that hydroxyl functionalized carbon nanotubes as set forth in Figures 1 and 2 of Applicants' specification were known, and motivated by the desire of forming a conventional reinforced composite with improved chemical compatibility when joining the nanotubes to the matrix. It should be noted that absent evidence to the contrary, the claimed structures would appear to result once the prior art combination is formed.

**Regarding the specifically claimed method of preparing the hydroxyl-functionalized carbon nanotubes**, such a method of preparing is interpreted as a product-by-process limitation. Absent a showing to the contrary, it is Examiner's position that the article of the applied prior art

is identical to or only slightly different than the claimed article. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985). The burden has been shifted to Applicant to show unobvious differences between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983). The applied prior art either anticipated or strongly suggested the claimed subject matter. It is noted that if Applicant intends to rely on Examples in the specification or in a submitted declaration to show unobviousness, Applicant should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with the applied prior art.

**Regarding the structure of the carbon nanotubes in rolled up graphene sheets, Ton-That** teaches that the nanocomposites are useful in the fabrication of a variety for materials including parts for electronics (Ton-That, Abstract). Since Ton-That is silent as to whether the nanotubes are in sheet form, it would have been necessary and therefore obvious to look to the prior art for conventional nanotube structures suitable for use in electronics.

Clark teaches an electrically conductive composition comprising a polymeric resin and single wall carbon nanotubes (Clark, Abstract). Clark teaches that the single wall nanotubes are formed into graphene sheets which are rolled up producing nanotubes of various helical structures (Id., paragraph 0023). Clark teaches that the compositions can be utilized in computer, electronic goods or the like which need to be protected from electrostatic dissipation, or in

automotive body panels (Id., paragraph 0016). It would have been obvious to one of ordinary skill in the nanotube composition art at the time the invention was made to form the nanotube composition of the prior art composition, wherein the nanotubes are in the form of graphene sheets, as taught by Clark, motivated by the desire of forming a conventional nanotube composition having nanotubes in a sheet form known in the art as being predictably suitable for use in electronic goods.

Regarding claim 74, although the prior art combination does not appear to specifically teach that the organosilane species comprises oxygen covalently bound to the carbon nanotubes, the prior art combination teaches a substantially similar structure and composition as the claimed invention. Therefore, it is reasonable for one of ordinary skill in the art to expect that once the prior art combination is formed, the oxygen of the organosilane species will inherently covalently bond to the carbon nanotubes, as both the glass fibers and the carbon nanotubes are organosilane-functionalized, and functionalizing the carbon nanotubes increases the number of bonding sites to the epoxy resin.

Additionally, regarding the limitation that the adding comprises introducing the silane-functionalized carbon nanotubes onto the fibers, it should be noted that the limitation is interpreted as a product by process limitation. Absent a showing to the contrary, it is Examiner's position that the article of the applied prior art is identical to or only slightly different than the claimed article. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even

though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985). The burden has been shifted to Applicant to show unobvious differences between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983). The applied prior art either anticipated or strongly suggested the claimed subject matter. It is noted that if Applicant intends to rely on Examples in the specification or in a submitted declaration to show unobviousness, Applicant should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with the applied prior art.

11. Claim 75 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ton-That in view of Flautt, as applied to claims 41 and 45-47 above, and further in view of Applicants' specification and Clark.

Regarding claim 75, the prior art combination does not appear to teach that the organosilane species comprises nitrogen covalently bound to the carbon nanotubes.

Applicants' specification teaches that prior art hydroxyl-functionalized carbon nanotubes include structures set forth in Figures 1 and 2 of Applicants' specification and set forth below:

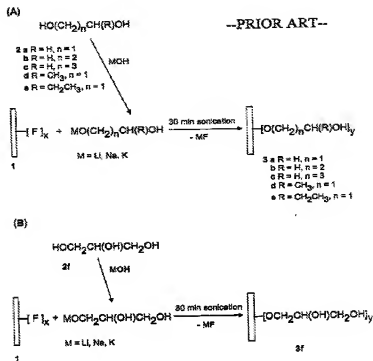


Fig. 1

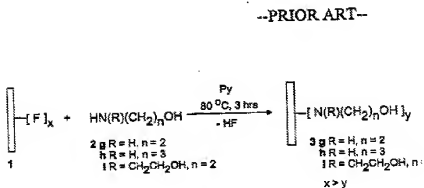


Fig. 2

Additionally, Clark teaches functionalized single wall carbon nanotubes, wherein the nanotubes are functionalized with an amine, a hydroxyl and/or an organosilane, among others (Clark, paragraphs 0026-0039). Clark teaches that the functionalized single wall nanotubes are better dispersed into polymeric resins because the modified surface properties may render the single wall nanotubes more compatible with the polymeric resin, or, because the modified functional groups (particularly hydroxyl or amine) are bonded directly to the polymeric resin as terminal groups (Id., paragraph 0040). Clark teaches that polymeric resins bond directly to the nanotubes making the nanotubes easier to disperse with improved adherence (Id.). It would have been obvious to one of ordinary skill in the nanotube composition art at the time the invention was made to form the nanotube composition of the prior art composition, wherein the organosilane comprises nitrogen, as taught by Applicants' specification and Clark, motivated by the desire of forming a conventional nanotube composition which are better dispersed into polymeric resins because the modified surface properties may render the single wall nanotubes more compatible with the polymeric resin, or, because the modified functional groups (particularly hydroxyl or amine) are bonded directly to the polymeric resin as terminal groups.

Additionally, although the prior art combination does not appear to specifically teach that the organosilane species comprise nitrogen covalently bound to the carbon nanotubes, the prior art combination teaches a substantially similar structure and composition as the claimed invention. Therefore, it is reasonable for one of ordinary skill in the art to expect that once the prior art combination is formed, the nitrogen of the organosilane species will inherently covalently bond to the carbon nanotubes, as both the glass fibers and the carbon nanotubes are

organosilane-functionalized, and functionalizing the carbon nanotubes increases the number of bonding sites to the epoxy resin.

Additionally, regarding the limitation that the adding comprises the claimed steps, it should be noted that the limitation is interpreted as a product by process limitation. Absent a showing to the contrary, it is Examiner's position that the article of the applied prior art is identical to or only slightly different than the claimed article. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985). The burden has been shifted to Applicant to show unobvious differences between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983). The applied prior art either anticipated or strongly suggested the claimed subject matter. It is noted that if Applicant intends to rely on Examples in the specification or in a submitted declaration to show unobviousness, Applicant should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with the applied prior art.

#### ***Response to Arguments***

12. Applicants' arguments filed October 5, 2011, have been fully considered but they are not persuasive. Applicants argue that bonding of the organosilane-functionalized carbon nanotubes to the epoxy resin contrasts with bonding of organosilane-functionalized carbon nanotubes to

fiber reinforcement material. Examiner respectfully disagrees. As set forth above, based on the totality of the teachings of the prior art combination, it would have been obvious to one of ordinary skill in the composite art at the time the invention was made to form the composite material of Ton-That, wherein the glass fibers are sized with an organosilane, as taught by Flautt, motivated by the desire of forming a conventional composite material wherein the interfilament abrasion of the glass fibers is reduced, the compatibility of the fibers with the epoxy matrix material is improved, and the physical properties of the composite material is enhanced.

Regarding the claimed covalent bonding, each of Ton-That and Flautt independently teaches the incorporation of an organosilane with each of the nanofibers and the glass fibers, and the attendant advantages. Additionally, based on the combined teachings of Ton-That and Flautt, it is reasonable for one of ordinary skill in the art to expect that functionalizing the carbon nanotubes increases the number of bonding sites between the carbon nanotubes and the epoxy resin, and that functionalizing the glass fibers with a silane improves bonding with the epoxy resin and the carbon nanotubes, since the nanotubes are additionally functionalized with a silane.

Additionally, the prior art combination teaches a substantially similar structure and composition as the claimed invention. Additionally, based on Applicants' specification and Applicants' submissions of June 28, 2010, the organosilane-functionalized glass fibers will naturally covalently bond with the organosilane-functionalized carbon nanotubes. Therefore, it is reasonable for one of ordinary skill in the art to expect that once the prior art combination is formed, the carbon nanotubes will covalently bond to both the fiber reinforcement material and the epoxy resin, as both the glass fibers and the carbon nanotubes are organosilane-

functionalized, and functionalizing the carbon nanotubes increases the number of bonding sites to the epoxy resin.

Applicants argue that in the process limitations, one of ordinary skill in the art would expect that the respective silanes each bond to the epoxy resin, which contrasts with an organosilane species that functionalizes both the carbon nanotubes and the fiber reinforcement material. Examiner respectfully disagrees. As set forth above, it is unclear whether the fiber reinforcement material and carbon nanotubes are functionalized with literally the same organosilane species, or whether the fiber reinforcement material and carbon nanotubes are functionalized with the same type of organosilane species. For purposes of examination, the claim will be interpreted as the fiber reinforcement material and carbon nanotubes being functionalized with the same type of organosilane species.

As set forth above, the prior art combination teaches a substantially similar structure and composition as the claimed invention. Additionally, based on Applicants' specification and Applicants' submissions of June 28, 2010, the organosilane-functionalized glass fibers will naturally covalently bond with the organosilane-functionalized carbon nanotubes. Therefore, it is reasonable for one of ordinary skill in the art to expect that once the prior art combination is formed, the carbon nanotubes will covalently bond to both the fiber reinforcement material and the epoxy resin, as both the glass fibers and the carbon nanotubes are organosilane-functionalized, and functionalizing the carbon nanotubes increases the number of bonding sites to the epoxy resin.

Regarding the claimed method of forming the composite material, it should be noted that the limitations are interpreted as product by process limitations. Absent a showing to the

contrary, it is Examiner's position that the article of the applied prior art is identical to or only slightly different than the claimed article. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985). The burden has been shifted to Applicants to show unobvious differences between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983). The applied prior art either anticipated or strongly suggested the claimed subject matter. It is noted that if Applicants intend to rely on Examples in the specification or in a submitted declaration to show unobviousness, Applicants should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with the applied prior art.

Applicants argue that amended claim 68 recites undestroyed rolled up graphene sheets and "catalytically reacting." Applicants argue that one of ordinary skill would not have expected the oxidative procedure taught by Velasco-Santos to preserve the graphene sheet. Examiner respectfully disagrees. Velasco-Santos is not relied on to teach the claimed graphene sheet. Therefore, Applicants' arguments are not commensurate in scope with the current rejection. Additionally, Applicants do not provide evidence that a graphene sheet is not compatible with the procedure set forth in Velasco-Santos. Additionally, it should be noted that the claim does not recite "catalytically reacting."

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter Y. Choi whose telephone number is (571)272-6730. The examiner can normally be reached on Monday - Friday, 08:00 - 15:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer Chriss can be reached on (571) 272-7783. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Peter Y Choi/  
Primary Examiner, Art Unit 1786